

INCH-POUND

MIL-H-44466  
11 June 1993

## MILITARY SPECIFICATION

## HEATER, MOUNTED WATER RATION

This specification is approved for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This document covers one type of heater for use by mounted troops that will heat rations and water for beverages and limited personnel hygiene.

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

## SPECIFICATIONS

## FEDERAL

PPP-B-636 - Box, Shipping, Fiberboard

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to: U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5018 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 7310

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## MILITARY

- MIL-L-3661/41 - Lampholders, Indicator Lights, Indicator-Light Housings, and Indicator-Light Lenses, General Specification for
- MIL-P-514 - Plates, Identification, Instruction and Marking, Blank
- MIL-W-5086/2 - Wire, Electrical, Polyvinyl Chloride Insulated, Nylon Jacket, Tin Coated Copper Conductor, 600 Volt, 105 Deg. C

## STANDARDS

## FEDERAL

- FED-STD-H28 - Screw-Thread Standards for Federal Services

## MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-129 - Marking for Shipment and Storage
- MIL-STD-130 - Identification Marking of U.S. Military Property
- MIL-STD-335 - Manuals Technical Repair Parts and Special Tools List
- MIL-STD-147 - Palletized Unit Loads
- MIL-STD-461 - Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference
- MIL-STD-462 - Electromagnetic Interference Characteristics, Measurements of
- MIL-STD-810 - Environmental Test Methods and Engineering Guidelines
- MS 3452 - Connectors, Receptacle, Electrical, Box Mounting, Rear Release, Crimp Contract, AN Type
- MS 27718 - Switch, Toggle, Miniature Single Pole, Toggle Seal

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

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DRAWINGS

U.S. ARMY NATICK RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER

5-13-5623 - Figure 1. Dimensional Requirements for Mounted  
Water Ration Heater (MWRH)

(Copies of drawings are available from the U.S. Army Natick Research, Development, and Engineering Center, ATTN: SAINC-UXT, Natick, MA 01760-5017.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A 240 - Specification for Heat - Resisting Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
- A 276 - Specification for Stainless and Heat - Resisting Steel Bars and Shapes
- A 479 - Specification for Stainless and Heat - Resisting Steel Wires, Bars, and Shapes for Use in Boilers and other Pressure Vessels
- D 3951 - Standard Practice for Commercial Packaging

(Copies may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME/ANSI PTC 25.3-1988 - Safety and Relief Valves

(Copies may be obtained from the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10036.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

Standard No. 70 - National Electrical Code

(Copies may be obtained from the National Fire Protection Association, 60 Batterymarch Street, Quincy, MA 02169.)

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NSF International

- Standard No. 2 - Food Service Equipment
- Standard No. 4 - Commercial Cooking, Rethermalization and Powered Hot Food Holding and Transport Equipment

(Application for copies should be addressed to the NSF International, 3475 Plymouth Rd., P.O. Box 1468, Ann Arbor, MI 48106.)

UNDERWRITERS LABORATORIES INC. (UL)

Standard 499 - Standard for Electric Heating Appliances

(Copies may be obtained from Underwriters Laboratories, Inc., 333 Pflingsten Road, Northbrook, IL 60062.)

(Non-government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.3.

3.2 Codes and standards. The Mounted Water Ration Heater (MWRH) shall comply with the applicable requirements of National Fire Protection Association (NFPA) Standard No. 70, NSF international Standard No. 2 and Standard No. 4, Underwriters Laboratories Inc. (UL) Standard 499, and The American Society of Mechanical Engineers (ASME/ANSI) PTC 25.3-1988 (see 4.5).

3.3 Materials and components. The materials and components used shall conform to the applicable referenced specifications, standards, and requirements specified herein. Materials used for potable water and food contact areas shall add no toxic metals to the potable water or food. Where materials are not definitely specified, they shall be of the quality normally used for the purpose in commercial practice provided the completed items comply with all provisions of this document (see 6.4). Components, including accessories, instruments, and controls, except Military standard items, shall be a current standard catalog product of its manufacturer except for any modifications required to meet document requirements. Commercial tolerances shall apply to all metal thicknesses and diameters unless otherwise specified.

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3.3.1 Fastening devices. Steel bolts, nuts, screws, washers, latches, hinges and other hardware used on the heater shall be made of stainless steel. Fastener threads shall conform to FED-STD-H28.

3.3.2 Stainless steel.

3.3.2.1 Sheet and strip. All sheet and strip shall be made of stainless steel and conform to ASTM-A240 Types 304 and/or 316.

3.3.2.2 Stainless steel rod. All rod shall be made of stainless steel and conform to ASTM-A276 or ASTM-A479 Types 304 and/or 316.

3.4 Design and construction. The Mounted Water Ration Heater (MWRH) and all components thereof shall conform to the requirements specified herein. Overall dimensions shall be as specified on figure 1. The MWRH shall be constructed of stainless steel with a minimum one gallon, crevice free main water compartment and one removable inner container with minimum capacity of 40 fluid ounces and 5 Meal Ready to Eat (MRE) entrees. With the removable inner container placed inside the main water compartment, the minimum volume in the main water compartment beneath the removable inner container shall be 40 fluid ounces. The inner container shall be constructed of stainless steel and must be crevice free, easily cleaned and have a stainless steel handle. All food or potable water contact surfaces of the MWRH, the main water compartment and the inner container shall have a #3 stainless steel finish. All inner corners and angles must be a minimum 1/8 inch radius. Filler metals must not be used to form the radii. Any gasket/seal material used on a surface that may contact food or potable water shall be made of food grade material. The MWRH shall be provided with, but not limited to, the following environmentally sealed electrical components, a heater element, thermostatic controls, two indicator lights, an electrical supply receptacle, and a three position toggle switch. The maximum net weight of the MWRH when empty shall not exceed 25 pounds. The MWRH shall be constructed with proper insulation and accessories, instruments, and controls necessary to meet the operational requirements of 3.4.2. Provisions shall be made to allow for accessibility to adjust, service, and replace any major component of the MWRH. Unless otherwise specified herein, the detailed design of the MWRH to meet the requirements of this document shall be the responsibility of the contractor. All component parts of the MWRH shall be interchangeable with the same parts of other MWRHs furnished on the same contract. The MWRH shall be capable of withstanding storage temperatures of plus 160°F for 4 hours and minus 60°F for 4 hours without failing to operate, or causing permanent set or loss of resiliency of gaskets, or discoloring, cracking, or bulging of the unit, when tested as specified in 4.6.6.

3.4.1 MWRH enclosure. The MWRH base dimensions and the overall dimensions for the enclosure and all external component shall be as shown in figure 1. The MWRH shall be provided with removable stainless steel access panels on the front and/or base of the heater unit for repair and replacement of all internal components. Access panels shall be capable of being detached and

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attached numerous times without the use of glues or special tools. The MWRH shall be provided with a stainless steel lid with a stainless steel handle wrapped in insulation. The lid shall be capable of being closed and secured to form a watertight seal to prevent spillage during movement when tested as specified in paragraph 4.6.10. The lid shall also be quickly removable for sanitation purposes. The two pressure relief valves (see 3.4.1.2), the water spigot (see 3.4.1.1), the electrical supply receptacle (see 3.4.1.4), the three position toggle switch (see 3.4.1.5) and two indicator lights (see 3.4.1.3) shall be externally mounted on the MWRH.

3.4.1.1 Water spigot. The MWRH shall be provided with a heavy duty externally mounted water tap as shown on figure 1. The tap shall be easily operated to provide water flow while preventing accidental activation when operated with appropriate hand wear. A guard may be used as an acceptable means for preventing accidental activation. The tap shall be capable of being detached, dismantled, reassembled and attached for quick cleaning using only common hand tools and without special tools as defined in paragraph 3.16 of MIL-STD-335.

3.4.1.2 Pressure relief valves. Two pressure relief valves shall be provided to prevent pressure build up inside the MWRH. The pressure relief valves shall be protected with a guard, and the guard shall not prevent the replacement of the valves. One pressure relief valve shall be used to prevent the pressure in the main water compartment from exceeding 1/3 psig. Another pressure relief valve shall be used to prevent the pressure in the inner compartment from exceeding 1 psig. The contractor shall certify that the valves operation conforms to the applicable requirements of ASME/ANSI PIC 25.3-1988.

3.4.1.3 Indicator lights. The MWRH shall be equipped with two indicator lights, a green one that indicates when the MWRH is drawing any current and a white one that indicates when the heating elements are operating. The indicator lights shall conform to MIL-L-3661/41. The indicator lights shall be mounted as shown on figure 1. The lights will be operable in low light, no light, or blackout conditions.

3.4.1.4 Electric Supply Receptacle. The MWRH shall be provided with an externally mounted electrical supply receptacle as shown on figure 1. The receptacle shall be located with the polarizing key on the top and the pins shall have the following connection requirements: Pin A positive, Pin B negative, and Pin C no connection. The receptacle shall conform to MS 3452W-16-10P and shall be easily detached and attached without special tools.

3.4.1.5 Toggle Switch. The MWRH shall be provided with an externally mounted, 3 position, toggle switch as shown in figure 1. The three positions shall be left, middle and right. The contractor shall indicate on the MWRH at the toggle switch the positions for High, Off, and Low. With the switch in the middle position the MWRH shall be off. With the toggle switch in the right position, the MWRH shall operate on the high temperature setting

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specified in 3.4.2.1. With the toggle switch in the left position, the MWRH shall operate on the low temperature setting specified in 3.4.2.1. The toggle switch shall conform to MS27718-21-1 and shall detach and attach from the MWRH without special tools.

3.4.2 Operating conditions. The MWRH shall operate on 24/28 volt DC and shall not exceed 15 amps at 28 volts when tested as specified in 4.6.1.

3.4.2.1 Thermostatic settings. The MWRH shall automatically maintain two temperature settings, low and high. The low temperature setting shall maintain one half gallon of water at a temperature range between 150°F and 160°F when tested as specified in 4.6.4.1. The high temperature setting shall maintain one half gallon of water at a temperature range between 180°F and 190°F when tested as specified in 4.6.4.2.

3.4.2.2 Heating.

3.4.2.2.1 Heating Water. The MWRH shall increase the temperature of one gallon of water, one hundred degrees Fahrenheit in one hour maximum at an ambient of 70°F when tested as specified in 4.6.2.

3.4.2.2.2 Heating Rations. The MWRH shall be capable of heating 40 fluid ounces of water in the main compartment and 5 MRE entrees in the inner container to a temperature range between 150°F and 160°F with the external surface temperature of the MWRH not to exceed 120°F when tested as specified in paragraph 4.6.3.

3.4.2.3 Environmental conditions.

3.4.2.3.1 Low temperature operating. The MWRH shall be capable of starting and operating in ambient temperature of -25°F when tested as specified in 4.6.2.1.

3.4.2.3.2 High temperature operating. The MWRH shall be capable of starting and operating in ambient temperature of 140°F when tested as specified in 4.6.2.2.

3.4.2.3.3 Humidity. The MWRH shall be capable of operating at a temperature of 140°F and 94% ± 4% humidity when tested as specified in 4.6.8.

3.4.2.3.4 Durability. The MWRH shall not be damaged, distorted, or leak and shall remain operable after being raised 12 inches and dropped onto a concrete surface 5 times while operating when tested as specified in 4.6.9.

3.4.2.4 Automatic shut down. The MWRH shall be equipped with a sensor which automatically shuts off the power when the water level in the main compartment is empty and/or the internal temperature exceeds 205°F when tested as specified in 4.6.5. When the MWRH has cooled down, after the automatic shut down has occurred, the MWRH shall operate normally.

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3.4.2.5 Heat retention. The water heated with the MWRH shall retain 45 percent of its maximum achieved temperature for a least three hours after the MWRH has been turned off, when tested as specified in paragraph 4.6.7.

3.4.3 Electromagnetic compatibility. When specified (see 6.2), the MWRH shall conform to the electromagnetic emission requirements of Part 4, Class A3 of MIL-STD-461 when tested as specified in 4.6.11.

3.4.4 Electrical wiring. All electrical wiring shall be neatly arranged, supported, and numerically marked for easy identification with the wiring diagram. Connectors shall be of the pressure type. All control wire shall be in accordance with MIL-W-5086/2. Wiring shall be supported to prevent sagging and chafing. Wiring practices shall be in accordance with NFPA 70.

3.4.5 Reliability. The MWRH shall be capable of demonstrating a mean time between essential mission failure (MTBEFF) of at least 640 operational hours at a minimum confidence level of 80% when tested as specified in 4.6.12.

3.4.6 Finish. The exterior and interior surfaces of the enclosure and base of the MWRH shall have a number 4 finish in accordance with ASTM A 240. The interior surfaces of the water compartment and all surfaces of the removable inner container shall have a number 3 finish in accordance with ASTM A 240.

3.4.7 Vibration. The MWRH shall be capable of withstanding vibration when tested as specified in 4.6.13.

### 3.5 Marking.

3.5.1 Data name plate. The MWRH unit shall have a metal identification plate attached to the outside of the unit enclosure. The metal plate shall conform to type III, composition A, class 1 or 2 of MIL-P-514 and shall be permanently attached. The identification plate shall be marked in accordance with MIL-STD-130 as follows:

1. U.S.
2. Military model number and nomenclature.
3. National Stock Number (NSN).
4. Serial number.
5. Contract number.
6. Manufacturer's name and address.
7. Model number.
8. CAGE number.
9. Technical manual number. (see 6.2)
10. Weight.

Lettering shall be permanent and not be less than 1/16 inch in height. Each plate shall be placed so as to be readily visible to the operator during normal operation and use, and so as to not adversely affect the life or utility of the MWRH.



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3.5.2 Instruction plate. Instruction plates made of corrosion-resisting metal shall be attached permanently to the MWRH. The instruction plates shall have the following instructions:

This system is designed to ONLY HEAT:

- Meals, Ready-to-Eat (MREs).
- Sealed containers of food.
- Drinkable water.

This system will NOT cook, boil, or fry foods,  
and it will NOT disinfect or decontaminate water.

The REMOVABLE CONTAINER and HANDLE will be extremely HOT.  
Use gloves or other hand protection.

Do NOT use removable container for personal hygiene (shaving, washing, etc.)

Use only APPROVED cleaning material as identified in the technical manual.

In addition, information as required by UL Standard No. 499 shall also appear on the plate. Lettering shall be permanent and shall not be less than 1/16 inch high.

3.6 Workmanship. Sheet metal or structural sections used in fabrication of the MWRH shall not be kinked, wrinkled, or bent. Bolts, nuts and screws shall be drawn tight and so secured that they will not work loose under vibration.

3.7 Welding. Welded joints shall be such that grinding of the finish weld shall not be a requirement, except when required for fit or sanitation. All surfaces to be welded shall be clean and free from scale, paint, grease, or other foreign matter. Welds shall have thorough penetration, good fusion and shall be free from scabs, blisters, abnormal pock marks, cracks, voids, slag inclusions, and other harmful defects. Welded assemblies shall be cleaned to remove any scale, oxidation products, and excess flux. Any acid used in cleaning shall be completely neutralized and removed.

3.8 Dissimilar metals. Contact areas between dissimilar metals shall be insulated to minimize galvanic corrosion by coating the surfaces of both metals with asphaltic-type compounds or by strips of rubber.

3.9 Service and maintenance. All major assemblies and installed components shall be accessible for maintenance, repair, service, and replacement with minimum disturbance to adjacent components in the MWRH and without usage of special tools.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance

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of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirement in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Responsibility for dimensional requirements. Unless otherwise specified in the contract or purchase order, the contractor is responsible for ensuring that all specified dimensions have been met. When dimensions cannot be examined on the end item, inspection shall be made at any point, or at all points in the manufacturing process necessary to ensure compliance with all dimensional requirements.

4.1.3 Certificates of compliance. When certificates of compliance are submitted, the Government reserves the right to inspect such items to determine the validity of the certification.

4.2 Classification of inspection. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).

4.3 First article inspection. When a first article is required (see 3.1 and 6.2), it shall be examined for defects specified in table II, tested as specified in table III, and shall be examined for conformance to 4.4.4. Any nonconformance shall be cause for rejection of the first article.

4.4 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.4.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

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4.4.2 In-process examination. Examination shall be made of the following fabrication processes to establish conformance with specification requirements. Whenever nonconformance is noted, correction shall be made to the process and all items processed.

- a. Internal wiring (see 3.4.4)
- b. Surfaces finished (see 3.4.6)
- c. Preparation of surfaces to be welded and welding required (see 3.7)
- d. Insulation of contact areas between dissimilar metals (see 3.8)

4.4.3 End item visual examination. The end item shall be examined for the defects listed in table II. The lot size shall be limited to the number of MWRH units produced during a particular month (i.e. all the units produced during January). The lot size shall be expressed in units of one MWRH. The sample unit shall be one MWRH. The inspection level shall be II and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 1.0 for major defects and 6.5 for total (major and minor combined) defects.

TABLE II. End item visual defects

Examine	Defect	Classification	
		Major	Minor
Finish	Not finished where required	101	
	Not finished as specified	102	
	Component or assembly painted or coated where not required	103	
Design, construction and workmanship (applicable to all components and assemblies)	Any component fractured, split, punctured, dented, deteriorated, bowed, or malformed	104	
	Any component not accessible for servicing where required	105	
	Any component not mounted or located as specified	106	
	Inner compartment not provided, not as specified	107	
	Capacity of compartment and container not as specified	108	
	Material not as specified	109	
	Gasket material on a surface that may contact food or potable water is not food grade	110	
	All inner corners and angles not having a minimum 1/8 inch radius	111	
	Filler material used to form the radii	112	

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TABLE II. End item visual defects (cont'd)

Examine	Defect	Classification	
		Major	Minor
MWRH enclosure	Access panels not located as specified	113	
	Panels not detached and attached without special tools or glues	114	
	Lid not provided, not removable, not as specified	115	
Water spigot	Not provided, not located as specified	116	
	Not easily operated		201
	Does not prevent accidental activation	117	
	Not detached, dismantled, reassembled and attached using only common hand tools and without special tools	118	
Pressure relief valves	Not provided, not as specified	119	
	No Guard provided	120	
Indicator lights	Not provided, not located as specified	121	
	Lights do not indicate as specified	122	
	Not operable for low light, no light or blackout conditions	123	
	Color not as specified	124	
Electrical supply receptacle	Not provided, not as specified	125	
	Not located as specified	126	
	Not detached and attached without special tools	127	
Toggle switch receptacle	Not provided, not as specified	128	
	Not located as specified	129	
	Not detached and attached without special tools	130	
Electrical wiring	Not as specified	131	
	Not neatly arranged and supported to prevent sagging and chafing		202
	Not numerically marked for easy identification with the wiring diagram	132	
	Connectors not the pressure type	133	

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TABLE II. End item visual defects (cont'd)

Examine	Defect	Classification	
		Major	Minor
Welding	Scale or flux not removed		203
	Welds not ground smooth and finished, where required to fit		204
Data name plate	Missing, incomplete, illegible, not in proper location, not permanently affixed or marked in prescribed manner	134	
Instruction plate	Missing, incomplete, illegible, not permanently affixed or marked in prescribed manner	135	

4.4.4 End item dimensional and weight examination. The end items shall be examined for conformance to the dimensions specified on figure 1 and weight requirements specified 3.4. Any dimension or weight not within the specified tolerance shall be classified as a defect. The lot size shall be the number of MWRH units produced in a particular month. The lot size shall be expressed in units of one MWRH. The sample unit shall be one MWRH. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 4.0.

4.4.5 End item testing. The MWRH shall be tested as specified in table III.

TABLE III. Testing order list

Test sequence	Requirement paragraph	Test	Test paragraph	Test units
1	3.4.2	Current test	4.6.1	All
2	3.4.2.2.1	Operational test	4.6.2	First article <u>1/2/</u>
3	3.4.2.3.1	Operational test low temperature	4.6.2.1	First article <u>1/</u>
4	3.4.2.3.2	Operational test high temperature	4.6.2.2	First article <u>1/</u>
5	3.4.2.2.2	MRE test	4.6.3	First article
6	3.4.2.1	Thermostat test (low)	4.6.4.1	First article <u>1/2/</u>
7	3.4.2.1	Thermostat test (high)	4.6.4.2	First article <u>1/2/</u>
8	3.4	Storage test	4.6.6	First article
9	3.4.2.5	Heat Retention test	4.6.7	First article <u>1/2/</u>
10	3.4.2.3.3	Humidity test	4.6.8	First article

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TABLE III. Testing order list (cont'd)

Test sequence	Requirement paragraph	Test	Test paragraph	Test units
11	3.4.2.3.4	Drop test	4.6.9	First article
12	3.4.1	Spill test	4.6.10	First article
13	3.4.3	Electromagnetic compatibility	4.6.11	First article <u>1/</u>
14	3.4.2.4	Over temperature control test	4.6.5	First article <u>1/2/</u>
15	3.4.5	Reliability test	4.6.12	First article <u>1/</u>
16	3.4.7	Vibration test	4.6.13	First article <u>1/</u>

1/ When a first article is not required these tests shall be performed on the first unit of production.

2/ One randomly selected MWRH shall be tested from each lot.

4.4.6 Packaging inspection. The fully packaged end items shall be examined for the defects listed below. The lot size shall be expressed in units of shipping containers. The sample unit shall be one shipping container fully packaged. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 2.5.

<u>Examine</u>	<u>Defect</u>
Marking	Missing; incorrect; illegible; of improper size, location, sequence, or method of application
Materials	Component missing, damaged, or otherwise defective
Preservative application	Preservative improperly applied or missing

4.5 Certification compliance examination. Certification, certified test reports, or listing marks for codes and standards, as applicable, submitted as proof of compliance with 3.2 shall be examined and validated.

4.5.1 Underwriters' Laboratories, Inc. (UL). Acceptable evidence of meeting the applicable requirements of the Underwriters' Laboratories standards 499 shall be the UL label, a UL listing mark, or a certified test report from a recognized independent laboratory, acceptable to the Government, indicating that the MWRH conforms to the applicable requirements of the specified UL standards.

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4.5.2 NSF International. The contractor shall submit to the contracting officer a written certificate of compliance as proof that the MWRH meets the applicable requirements of NSF Standard No. 2 and NSF Standard No. 4.

4.5.3 National Fire Protection Association (NFPA). The contractor shall submit to the contracting officer a written certificate of compliance as proof that the MWRH meets the applicable requirements of NFPA Standard No. 70.

4.5.4 The American Society of Mechanical Engineers (ASME). The contractor shall submit to the contracting officer a written certificate of compliance as proof that the MWRH meets the applicable requirements of ASME/ANSI PTC 25.3-1988.

#### 4.6 Methods of inspection.

4.6.1 Current Test. The heater shall be connected to a 28 volt DC power supply and the toggle switch shall be turned all the way to the right and all the way to the left for 20 seconds each to determine compliance with 3.4.2. If the current exceeds 15 amperes and/or the current is below 10 amperes, it shall constitute a failure of the test.

4.6.2 Operational Tests. The MWRH shall be connected to a 28 volt DC power supply at an ambient temperature of approximately 70°F. One gallon of water at approximately 40°F shall be added to the main container to determine compliance with 3.4.2.2.1. The temperature of the water shall be taken and recorded as T1. The toggle switch shall be turned all the way to the right to the high temperature setting for one hour. After completion of the hour, the switch shall be turned to middle position so that the unit is off and the temperature of the water shall be taken and recorded as T2. Failure of the MWRH to increase the temperature of the water 100°F (T2 - T1 ≥ 100°F) shall constitute failure of this test.

4.6.2.1 Low temperature operation test. The test procedure specified in 4.6.2 shall be followed, except that the ambient air temperature shall be changed to -25°F to determine compliance with 3.4.2.3.1. Failure of the MWRH to increase the temperature of the water 100°F (T2 - T1 ≥ 100°F) shall constitute failure of this test.

4.6.2.2 High temperature operation test. The test procedure specified in 4.6.2 shall be followed, except that the ambient air temperature shall be changed to 140°F to determine compliance with 3.4.2.3.2. Failure of the MWRH to increase the temperature of the water 100°F (T2 - T1 ≥ 100°F) shall constitute failure of this test.

4.6.3 MRE Test. The MWRH shall be connected to a 28 volt DC power supply at an ambient temperature of approximately 70°F. Forty ounces of water at approximately 70°F in temperature shall be added to the main compartment to determine compliance with 3.4.2.2.2. Five MREs with any water necessary for convection at approximately 70°F in temperature shall be placed into the

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inner container, then the inner container shall be placed into the main compartment. The toggle switch shall be turned all the way to the right to the high temperature setting. At 5 minute intervals the external surface temperature of the MWRH enclosure shall be taken and recorded. Any external surface temperature exceeding 120°F shall constitute failure of this test (see 3.4.2.1.2). Also at 5 minute intervals the temperature of the 5 MREs shall be taken until the temperature of the MREs is increased to a range between 150° and 160°. The time that it takes to reach the required temperature range shall be recorded. Failure of the MWRH to increase the temperature of the 5 MREs to a temperature range between 150°F and 160°F shall constitute failure of this test.

#### 4.6.4 Thermostat Tests.

4.6.4.1 Thermostat Tests low Setting. The MWRH shall be connected to a 28 volt DC power supply at an ambient temperature of approximately 70°F. One half gallon of water at approximately 70° shall be added to the main container to determine compliance with 3.4.2.1. The toggle switch shall be turned all the way to the left to the low temperature setting for 2 hours. After completion of the two hours the switch shall be turned to the off setting and the temperature of the water shall be taken and recorded. Failure of the MWRH to increase the temperature of the half gallon of water to a temperature range between 150°F and 160°F shall constitute failure of this test.

4.6.4.2 Thermostat Tests high Setting. The MWRH shall be connected to a 28 volt DC power supply at an ambient temperature of approximately 70°F. One half gallon of water at approximately 70° shall be added to the main container to determine compliance with 3.4.2.1. The toggle switch shall be turned all the way to the right to the high temperature setting for 2 hours. After completion of the two hours the switch shall be turned to the off setting and the temperature of the water shall be taken and recorded. Failure of the MWRH to increase the temperature of the half gallon of water to a temperature range between 180°F and 190°F shall constitute failure of this test.

4.6.5 Overtemperature Control Test. The MWRH shall be connected to a 28 volt DC power supply and no water shall be added to the MWRH. The MWRH shall be turned on to determine compliance with 3.4.2.4. The Internal temperature of the main compartment shall be monitored until it exceeds 205°F. Failure of the test shall occur if the overtemperature control switch does not stop the current and shut down the MWRH when the main compartment temperature exceeds 205°F. The MWRH shall be given sufficient time to cool down. Water shall then be added to the main container and operated to determine that the MWRH functions normally. Failure of the unit to operate properly shall also constitute failure of the test.

4.6.6 Storage Test. The MWRH shall be subject to a temperature of -60°F for 4 hours and then the room temperature shall be increased to the normal ambient room temperature and the MWRH shall be operated for 1 hour to



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determine compliance with 3.4. The MWRH shall then be subject to a temperature of 160°F for 4 hours and then the room temperature shall be decreased to the normal ambient room temperature and the MWRH shall be operated for 1 hour to determine compliance with 3.4. Any failure to operate, permanent set or loss of resiliency of gaskets, or discoloring, cracking, or bulging of the unit, shall constitute failure of this test.

4.6.7 Heat Retention Test. The MWRH shall be connected to a 28 volt DC power supply at an ambient temperature of approximately 70°F. One gallon of water shall be added to the main container to determine compliance with 3.4.2.5. The toggle switch shall be turned all the way to the right to the high temperature setting for 2 hours. After completion of the two hours the switch shall be turned to the off setting and the temperature of the water shall be taken and recorded as the maximum achieved temperature, T3. The switch shall remain in the off position for three hours. After completion of the three hours the temperature of the water shall be taken and recorded as T4. Failure of the MWRH to retain 45% of the maximum achieved temperature ( $T3 \div 2 < T4$ ) shall constitute failure of this test.

4.6.8 Humidity Test. The MWRH shall be subject to a temperature of 140°F and 94%  $\pm$  4% humidity for four hours and the MWRH shall be operated for 1 hour to determine compliance with 3.4.2.3.3. Failure of the MWRH to operate properly shall constitute failure of the test.

4.6.9 Drop Test. One half gallon of water shall be placed into the MWRH and then turned on. While operating, the MWRH shall be raised 12 inches clear from the floor and dropped onto a concrete surface 5 times to determine compliance with 3.4.2.3.4. The MWRH shall continue to be operated for 2 hours. Inability to operate or any leaks, or malfunction shall constitute failure of this test.

4.6.10 Spill test. One half gallon of water shall be placed into the MWRH and the lid shall be secured to determine compliance with 3.4.1. The container shall be placed on its side by rotating 90° and left for 10 minutes. The container shall then be placed on its next side by rotating 90° and left again for 10 minutes. This step shall be repeated until all four sides have been done. The MWRH shall then be turned upside down so that the MWRH is resting on its lid. Any leakage, except leakage thorough the pressure relief valves, shall cause failure of this test.

4.6.11 Electromagnetic compatibility tests. When electromagnetic compatibility is required, the first article shall be tested by the contractor for conformance with 3.4.3 in accordance with MIL-STD-462 following the measurement procedures for these methods: CE01, CE03, CS01, CS02, CS06, RE02, RS02, and RS03. The contractor shall furnish the contracting officer an EMI Test Report documenting the results of all tests performed to demonstrate compliance. Any MWRH not conforming to the appropriate electromagnetic emission requirements of Part 4, Class A3 of MIL-STD-461 and not meeting the required methods in MIL-STD-462 shall constitute failure of this test.

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4.6.12 Reliability test. To determine compliance with 3.4.5. The MWRH shall demonstrate a minimum of 1030 operation cycles (Approximately 1030 hours of operational test time) without failure. Up to 10 MWRH's may be utilized concurrently to achieve the total required number of test cycles. For the purpose of this test, a cycle is defined as one iteration of the test procedure specified in paragraph 4.6.2. Failure of the MWRH to increase the temperature of the water 100<sup>0</sup>F and failure of any component of the MWRH during the 1030 hours shall constitute failure of this test.

4.6.13 Vibration Test. The MWRH shall be tested by the contractor for conformance with 3.4.7 in accordance with MIL-STD-810 for Category 8 Ground Mobile vehicles. The MWRH shall be vibrated to the vibration environment of Table 514.4-AXVI for installed equipment on the sponsons of the M113 armored personnel carrier, following the requirements of Test Procedure I and Test Conditions I-3.4.7. The contractor shall furnish the contracting officer a Vibration Test Report documenting the results of all tests performed to demonstrate compliance. Failure of any unit to meet test criteria defined in section I-4.11 of MIL-STD-810 shall constitute failure of this test.

## 5. PACKAGING

5.1 Packing. Packing shall be level A, B or Commercial as specified (sec 6.2)

5.1.1 Level A packing. Each heater shall be packed upright in a fiberboard shipping container conforming to style RSC, grade V2s of PPP-B-636. Cushioning shall be used to provide a minimum 1-inch clearance between the top, ends and sides of the container and the protruding parts of the heater. Each shipping container shall be closed, waterproofed, and reinforced as specified in PPP-B-636.

5.1.2 Level B packing. Each heater shall be packed upright in a fiberboard shipping container conforming to style RSC, type CF, variety DW or SW, class domestic, grade 200 of PPP-B-636. Cushioning shall be used to provide a minimum 1-inch clearance between the top, ends, and sides of the container and the protruding parts of the heater. Each shipping container shall be closed in accordance with method II of the appendix of PPP-B-636.

5.1.3 Commercial packing. Each heater shall be packed in accordance with ASTM D 3951.

5.2 Palletization. When specified (see 6.2), heaters packed, as specified, shall be palletized in accordance with MIL-STD-147.

5.3 Marking. In addition to any special marking required by the contract or order, shipping containers and palletized unit loads shall be marked in accordance with MIL-STD-129.

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## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The MWRH is intended for use by mounted troops that will heat rations and water for beverages and limited personnel hygiene using the 24 Volt DC vehicle battery.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- c. When a first article is required (see 3.1, 4.3 and 6.3).
- d. When electromagnetic compatibility is required (see 3.4.3 and 4.6.11).
- e. Government approved manual number (see 3.5.1).
- f. Level of packing required (see 5.2).

6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of Federal Acquisition Regulation (FAR) 52.209-4. The first article should be a preproduction sample. The contracting officer should specify the appropriate type of first article and the number of units to be furnished. It has been determined that a minimum of 8 units is adequate to complete the first article. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for selection, inspection, and approval of the first article.

6.4 Recycled material. It is encouraged that recycled material be used when practical as long as it meets the requirements of this document (see 3.3).

6.5 Subject term (key word) listing.

Water heater  
Heater  
Ration heater  
Track vehicle  
MRE  
Hygiene

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Custodians:

Army - GL  
Air Force - 99

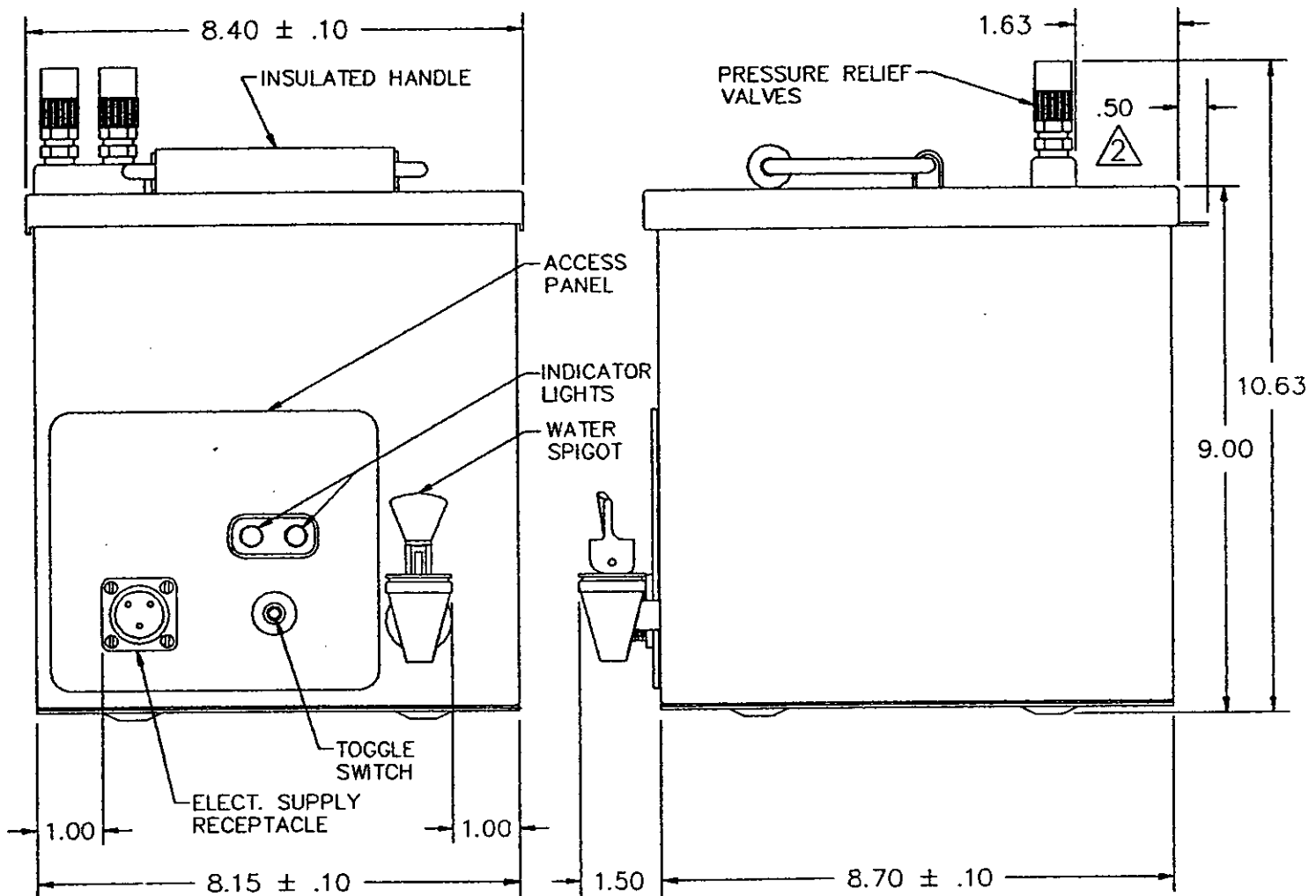
Review activities:

Army - MD  
Air Force - 84  
Navy - MC, SA

Preparing activity:

Army - GL  
(Project 7310-0830)

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## NOTES:

1. ALL ITEMS DEPICTED REPRESENT POTENTIAL LOCATIONS AND DESIGN. SEE PARAGRAPHS 3.4 THROUGH 3.4.1.5 FOR OTHER DESIGN REQUIREMENTS.

2. THE DIMENSION AT POTENTIAL HINGE LOCATION REPRESENTS MAXIMUM DIMENSION ALLOWED.

3. ALL DIMENSIONS ARE IN INCHES. UNLESS OTHERWISE NOTED TOLERANCES SHALL BE  $\pm .05$ .

FIGURE 1. DIMENSIONAL REQUIREMENTS FOR MOUNTED WATER RATION HEATER (MWRH)

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

**NOTE:** This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

<b>I RECOMMEND A CHANGE:</b>	1. DOCUMENT NUMBER MIL-H-44466	2. DOCUMENT DATE (YYMMDD) 1993 June 11
3. DOCUMENT TITLE HEATER, MOUNTED WATER RATION		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code)	7. DATE SUBMITTED (YYMMDD)
	(1) Commercial (2) AUTOVON (if applicable)	
8. PREPARING ACTIVITY		
a. NAME U.S. Army Natick RD&E Center	b. TELEPHONE (Include Area Code)	(2) AUTOVON /DSN
	508-651-4085	256-4085
c. ADDRESS (Include Zip Code) Commander, U.S. Army Natick RD&E Center ATTN: SATNC-WEE Natick, MA 01760-5018	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	

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